(ii) Explain the working of MESFET. Determine the expression for the voltage at the edge of the depletion region, V(h), in a MESFET device.

(iii) Consider the circuit shown in Fig. 3,

where, $I_s = 6 \times 10^{-16}$ A, $\beta = 100$, and $V_A = \infty$. Calculate the operating point of Q_1.

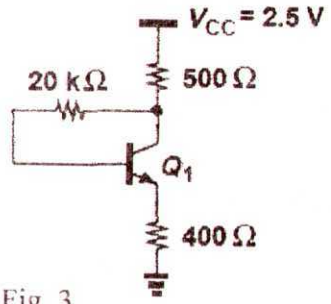

Fig. 3

PAPER ID : 3231

TEC-301 **Printed Pages : 4**

Paper ID and Roll No. to be filled in your Answer Book

Roll No.

B. Tech.

(SEM. III) (ODD SEM.) (REG./BACK) EXAMINATION, 2012-13

ELECTRONIC DEVICES & CIRCUITS

Time : **3** Hours] [Total Marks : **100**

Note : (1) All questions are compulsory and marks are indicated at the end of each questions

(2) Assume the missing data with suitable values

1 Attempt any four of the following **5×4=20**

(i) Why space charge region is called as depletion region? Which types of carriers are present in the space charge region?

(ii) Discuss the working of Schottky diode and hot carrier diode in brief.

(iii) A diode is biased at a current of 1 mA. (a) Determine the current change if V_D changes by 1 mV. (b) Determine the voltage change if I_D changes by 10%.

(iv) Give the Barkhausen conditions required in order for sinusoidal oscillators to be sustained.

(v) Derive an expression for the voltage gain of a CE transistor amplifier in terms of h-parameters.

(vi) What is the advantage of using quaternary alloy in fabricating LEDs?

2 Attempt any two of the following **10×2=20**

(i) In an experiment, it is desired to obtain equal electron and hole drift currents. How should the carrier densities be chosen? Assume $\mu_n / \mu_p = 1350/480$.

(ii) For the circuit shown in fig. 1, assume $\beta = h_{FE} = 100$. Find if the transistor is working in cut-off, saturation or active region.

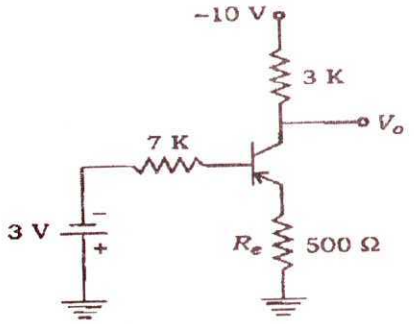

Fig.1

(iii) Determine the voltage gain of the stage shown in Fig.2

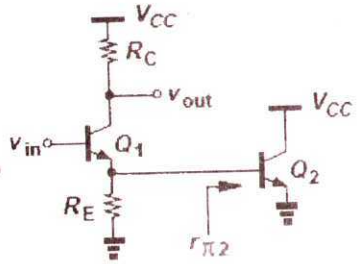

Fig.2

3 Attempt any two of the following **10×2=20**

(i) Of the available common-source, common-gate and source follower topology, which one provides a moderate voltage gain, a high input impedance, and a moderate output impedance? Explain how source degeneration raises the output impedance of CS stages considerably?

(ii) How MOSFETs can operate as voltage-dependent current sources? When a MOSFET can work as a voltage dependent resistor? Discuss in brief.

(iii) When MOSFETs operate in the "triode" region? In which region MOSFET find wide application in microelectronic circuits?

4 Attempt any two of the following **10×2=20**

(i) Which are the key parameters that enhance the performance of HBTs? Explain how the magnitudes of f_t and f_{max} varies between HBT and BJT structures.

(ii) Differentiate between DIAC and TRIAC and explain their working principles.

(iii) Explain the working of Solar Cells and discuss its performance parameters.

5 Write in brief on any two of the following **10×2=20**

(i) What is the relationship between the transfer gain with feedback A_f and that without feedback A ? Define the negative feedback. List five characteristics of an amplifier which are modified by negative feedback.